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9 December 1955

Perkin-Elmer Corporation
Projector Division
P. O. Box 68, Ridgeway Station
Stamford, Connecticut

Attention:

[Redacted]

STAT

Subject: Progress Report #4

Reference: Your Purchase Order No. 56207

Dear Sir:

Enclosed herewith are three (3) copies of Progress Report #4 on Aerial Surveying Equipment of referenced purchase order. The report covers the period through 30 November 1955.

Very truly yours,

HYCON MFG. COMPANY

[Redacted]

STAT

[Redacted] Manager
Photographic Products Division

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RHP/bab
Enclosure

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AERIAL SURVEYING EQUIPMENT

PROGRESS REPORT

Through November 1955

ITEM 1 - General

Sufficient configurations are on hand at the [] to support Flight Test Operations. The initial delivery of A-1 was six weeks late, although deliveries are now within ten days of schedule. Regaining schedule has been accomplished concurrently with an extensive modification of A-1 incorporating corrections in the rocking mount drive uncovered during flight test. Subsequent deliveries will be substantially on schedule.

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The first A-2 was delivered on schedule. The second unit, incorporating minor modifications, was delivered ten days behind schedule. Subsequent deliveries will be on schedule.

Configuration B has been running behind schedule. Assembly of the first unit has been initiated and will be completed during the fourth week of December. Delivery to the [] will be dependent on system test results and the extent of the modifications (if any) required. The delay in B is mainly attributable to commitment of engineering personnel to act in a Field Service capacity in lieu of scheduled Field Service personnel who were awaiting clearance. The commitments of these engineers resulted in delayed and changed engineering assignments which affected schedule.

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Work on Configuration C has been limited to those areas not affected by planned optical system changes. Design emphasis is directed primarily in the areas of stabilized mount, film drive, cassettes, etc. Rescheduling information will be available when optical changes are evaluated.

Final agreement has been reached on the ground handling equipment specifications and design and production efforts are rapidly accelerating. Prototypes have been constructed and are in test on four items. The most critical items are being expedited for [] use. Coordination must be obtained as to the frequency of missions planned during operations, since this may affect equipment quantities.

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Field Service personnel have been assigned [] and are maintaining continuous coverage. The Field Service Training Program is in full operation, utilizing lecture type instruction as well as familiarization with equipment through participation in assembly and test programs. At the

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ITEM 1 - General, Cont'd.

request of the customer any work done on the equipment program during the course of training is charged directly to the equipment program and not the training program.

Logistics planning meetings have been held and it is evident that additional coordination must be established. Spare parts, ground handling equipment and service teams have been planned toward a 200 mission program operating at a rate of approximately eight missions per month. Logistics plannings as revealed during meetings held at [] indicate that the highly mobile concept on which support equipment had been planned has been modified to a semi permanent base concept operating at a rate of 48 missions per month from the first base alone. STAT

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Item 2 - Contract Status

2.0 Letter of intent for Ground Handling Equipment amended 21 September 1955 to increase available funds.

2.1 The following Contract Change Proposals were submitted:

- 2.1.1 Contract Change Proposal #1 (Revised, Ground Support Equipment dated 14 November 1955 was submitted at a conference by WCM on 17 and 18 November and verbal approval of proposal was received.
- 2.1.2 Contract Change Proposal #2, Delivery Dates, Revised, 29 August 1955 was submitted 29 August 1955. Verbal acceptance of the change proposal was given by RMS, 29 August 1955.
- 2.1.3 Contract Change Proposal #3, Film Marking Device (Frame Counter), dated 29 August 1955, was submitted 29 August 1955. In view of the urgency of this work and in accordance with verbal instructions, engineering design and manufacture are proceeding.
- 2.1.4 Contract Change Proposal #4, Test Site Support, dated 1 November 1955, was submitted to RMS and verbally approved.
- 2.1.5 Contract Change Proposal #5, Deletion of Contract Item, dated 5 December 1955, was submitted same date and change was based on telecon of 5 December 1955 between TLB and RMS. This deleted one Equipment Transport Dolly from Test Support Equipment.

2.2 The following Contract Change Proposals are in Preparation:

- 2.2.1 70 mm Viewer
Specifications and technical description are being prepared in exhibit form.
- 2.2.2 Shelter for Preflight Checkout and Installation
This item was deferred as a result of the supply conference held 28 November through 1 December.
- 2.2.3 Technical Manuals
There will be changes in the manuals to be delivered as covered in the basic contract due to subsequent contract changes and proposals which changed equipment to be delivered.
- 2.2.4 New Platen for 9 x 18 Magazine Model HM-731
Estimates have been made and an exhibit will be prepared to be submitted as a contract change proposal for a new curved platen for the new 24" lens design of HR-731.

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2.3 The following contract change proposals are held awaiting further information:

2.3.1 Configuration C

Contract change proposal held pending receipt of final optical design data and evaluation of required changes.

2.3.2 Film Processing Equipment for Ground Support Operations
Specifications for a film processor and driver are contingent upon
operational experience

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ITEM 3 - Customer Furnished Equipment Status

3.1 The following items were received in the month of November:

November 17	(1) "B" Lens (36")
November 21	(1) "B" Mirror
November 23	(4) Rework 24" Lenses
November 30	(3) Rework 24" Lenses

3.2 A list of overhaul spare parts is being generated on the customer furnished shutters and cameras. When these parts are determined they will be requested from Air Force stores through project channels.

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ITEM 4 - Conference Notes

- 4.1 14 September 1955 - Washington, D. C. - George, DB, HM, WCM
General discussion on Contract Change Proposal #1 on Ground Support Equipment, 1 September 1955. Request was made to review proposal for simplification and provide preliminary specification on the equipment.
- 4.2 21 October 1955 - Suppliers Meeting on West Coast.
- 4.3 15 November 1955 - WW, FW, RW, RHP, WAS, TLB - Pasadena
Discussion on probable maintenance supply system for Test Site and Base A.
- 4.4 17 and 18 November 1955 - Washington, D. C. - George, WCM, DB,
Conference discussions on Contract Change Proposal #1 on Ground Support Equipment, revised, 14 November 1955, and Contract Change Proposal #4, Test Site Support Equipment, dated 1 November 1955. A verbal go-ahead was given.
- 4.5 28 November 1955 - 1 December 1955 - Maywood
Conferences of the suppliers to set up Test Site and A Base replacement spares system. Planning is now based on 6 A/C flying 8 missions each per month. Since spares have been provided on basis of 200 missions and service teams planned for 8 missions per month per base, it is obvious that spares and personnel planning must be re-evaluated.
- 4.6 30 November 1955 - Hycon - EG, WAS, DMT, RHP
Meetings were held with film people to coordinate film deliveries.

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Item 5 - Detailed Status of Configuration5.1 Configuration A

Configuration A-1, first article was delivered to Test Site on 27 October 1955 and initial test flight accomplished on 3 November 1955. A-1 second article, is complete and modified and will be shipped to Test Site on approximately 7 December 1955. A-1 first article has been returned to factory for modification of the rocking drive mechanism to latest design.

Configuration A-2 first article was shipped to Test Site on 13 September 1955 and initial test flight accomplished on 20 September 1955. A-2, second article, is complete and in test. It is scheduled for delivery to the Test Site approximately 13 December 1955.

5.1.1 Design

Design is complete including a modification of the A-1 rocking drive and a modification of the A-2 (HS-731) shutter trip mechanism to correct difficulties encountered in Test Site operations. Engineering is concerned with test and checkout procedures, and production surveillance.

5.1.2 Production

Production is proceeding on the complete production lots at an accelerated pace. Recovery of delivery schedule is expected.

5.1.3 Procurement

Modification of A-1 and the delay in receipt of fabricated covers for the HM-731 Magazines have caused delivery problems .

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5.2 Configuration B

Configuration B is behind schedule and the first unit will be assembled during the fourth week in December. Depending on the difficulties encountered and the extent of modifications, if any required, delivery of the first article will be made in January 1956.

5.2.1 Design

The design of Camera Model 73-B is generally complete. Engineering effort is principally concerned with preparation of parts lists, test and checkout procedures and production surveillance. Effort is being expended to improve shutter results.

The new lens design has a slightly shorter flange length and a different focal plane contour. Redesign of the lens cone and platen blank is complete. The exact focal plane contour is not yet available. Camera #1 will utilize the original lens design. Cameras #2 through #6 will utilize the modified design. Laboratory test and evaluation of the Mini-vib first article was completed, a test flight of this unit is planned for December.

5.2.2 Production

Production is proceeding and assembly of a number of components is underway. The programmer 1st article is complete and final testing is pending installation in the camera. The lens for Camera #1 was received from the optical manufacturer. A shutter mechanism was completed. Initial tests indicate shutter speed is somewhat slow. Additional careful testing and analysis is necessary to increase the speed.

5.2.3 Procurement

Procurement of Honeycomb structure for cassettes and camera superstructure continues to be a problem. Delivery is slow and first articles usually need rework to bring within tolerance.

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5.3 Configuration C

During the period of this report the optical system of Configuration C has been under major review as to its basic concept. The problem of adequate exposure required the consideration of a major revision in the optical concept and the tentative abandonment of the re-imaging system originally contemplated. From recent film processing techniques a major improvement in effective film speed can be anticipated, again allowing the use of the re-imaging optical system with approximately 180" focal length. During the design review all work was stopped on items which would be materially affected by the optical changes. Every effort has been taken to minimize the loss of design effort and schedule. The design emphasis was changed to the stabilized mount, film drive, cassettes, etc. An ingenious and relatively simple technique of stabilization proposed by RMS has been built in breadboard form and has shown excellent promise in test.

5.3.1 Design

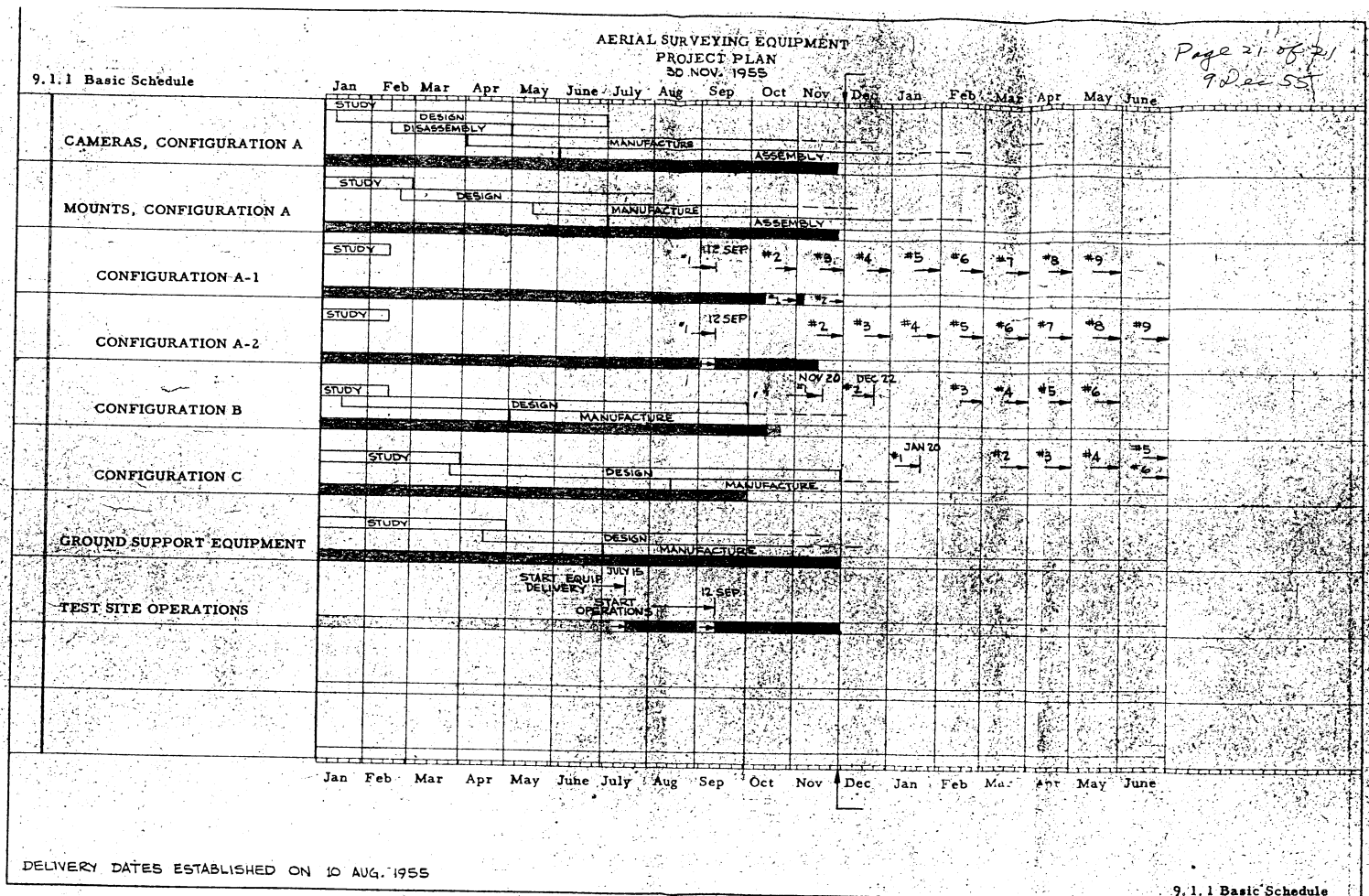
Design is complete on the film drive, cassettes, film spools and single axis stabilizer. The optical design has been confirmed to the extent that a reimagining system will be used and it is anticipated a primary image plane will be made accessible for a rotating disc focal plane shutter. Design of this shutter is complete and a breadboard model can be made. Design is in process on the three axis stabilizer, camera superstructure and film drive servo.

5.3.2. Production

Manufacture of the Film Drive, Cassettes and film spools is proceeding. Manufacture of the film drive servo breadboard has been initiated. Manufacture of the single axis stabilizer breadboard was completed and initial test and analysis work done. The principle is sound and additional work will be done on refinement of components.

5.3.3 Procurement

For the stabilizer, exceedingly sensitive rate gyros with minimum weight and cube are required. A survey is in process to select a suitable gyro which can be readily obtained.



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5.4 Ground Support Equipment

Initial activities have been concentrated upon design and manufacture of the items deemed essential to start a base operation. This complement includes such items as the Electrical Test Set, Shutter Test Set, Power Cart, Magazine and Cassette Transit Case and various benches and shop service equipment. The target date for delivery to the customer of the initial set of service complement has been established at 1 February 1956.

The remaining ground support equipment items essential, but not deemed mandatory at opening of base operations, will be supplied per contract delivery schedule.

5.4.1 Design

The design of the following items is in progress:

- Electrical Test Set
- Shutter Test Set
- Loaded Magazine & Cassette Transit Case
- Battery and Vacuum Cart
- Tote Box Bench
- Test Bench
- Preflight Test Stand

Lists of shop service tools and personnel kits are being added to as experience at [] indicates need. As designs of above items are completed, design of additional items will be initiated. STAT

5.4.2 Procurement

Procurement of the following items is in progress:

- Standard Transport Dolly
- Basic Cart for the Power Cart Assembly
- Purchase parts list for Power Cart Assembly
- Field Representative Tool Kits; Initial procurement complete
- Transit Case Cover and Base

5.4.3 Production

Prototypes of the following items have been completed and are being tested:

- Shutter Test Set

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5.4.3 Production, (Cont'd.)

Electrical Test Set (Configuration A test only)
Battery and Vacuum Cart
Mini-Vib Test Set

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5.5 Test Site Operations

A total of eight photographic Test Flight Missions were accomplished during November. Additional photo missions were scheduled, however, they were not completed due to aircraft engine difficulties and inclement weather.

Configuration A-1 was first flight tested in A/C 343. Results of the Tri-Camera (HC-730) installation performance were satisfactory with the exception of the data recording feature. Improvements are now being made through engineering changes to correct this situation. The rocking mount was flown on one mission. Results from this evidenced improper operation during the first portion of the photo run, after which the fault was cleared and good to excellent results were obtained. The detent and drive mechanisms were responsible for this maloperation and engineering design changes have since been made to overcome the difficulties.

Configuration A-2 was flown on six missions. Tests conducted included the use of a special 10% light transmission filter. Exposed unprocessed film from these missions was forwarded for special processing in the east. Other tests included the use of the Tilted Platen Magazine. Installed in the vertical position, this magazine enables the determination of camera focus at operating altitudes as influenced by air density and temperature changes. Photo runs were made over a pattern of high contrast resolution targets. The equipment bay temperatures have been consistently low, (0°C to -10°C). The A/C group is working on this. Evaluation of test film utilizing this special magazine shows on a preliminary basis that proper focus is being achieved on HR-731 cameras. However, further improvement in resolution is required and additional tests will be conducted. Improper vacuum at altitude has been evidenced on some missions as monitored by the automatic observer and by evaluating film under a microscope. Corrective action has been taken to increase the vacuum flow by providing separate lines to each camera. Further instrumentation in this area is now in progress, and might possibly result in the use of an accumulator tank. In general, A-2 results to date have ranged from good to excellent with a minimum of equipment failure.

Techniques in the handling and processing of the thin base film have improved through the use of special film spooling racks. Film processing facilities were expanded and improved during the base shut-down period from 20 November to 4 December. A new darkroom, 7' x 22' was constructed adjoining

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5.5 Test Site Operations, Cont'd.

the present service shop area, and will house the A-9 continuous processing machine and the A-14 dryer. This equipment will be operational approximately 15 December 1955. Space provisions in the new darkroom will also accommodate the 70mm processing equipment expected to be available in the near future.

Inadequacies of the shop and darkroom cooling system have been corrected as provisions have been made for the installation of a temperature and humidity controlled air conditioning unit.

The first two men of the Field Service Support Team were assigned to the Site on 8 November 1955 for indoctrination, training and to assist with the Photo Test Flight Program. Photo personnel are maintaining a continuous coverage at the site for reasons of coordination, security and emergencies. Initial provisioning of tools, supplies and test equipment for test site operation has been completed.

October 29, 1955

Flight Test Program, Test Site

Mission Number	Date	Time	Config.	Film Load	Nature and Results of Mission
-----	13 Sept.		A-2	-----	A-2 Serial #1 shipped to and received at Test Site. Visual, mechanical, electrical, optical checkout.
-----	14 Sept. thru 19 Sept.		A-2	-----	Trial installation and ground power checks, recording of operational functions. Satisfactory installation and preflight checkout indicated good compatibility with the A/C. No corrective action required.
T1F1 PTF #1	20 Sept.		A-2	200' Std. Class "L"	First flight with A/C #2 and first flight with Configuration A-2 and charter. Objective was to make operational mechanical and electrical checks. Results indicated satisfactory operation of equipment. No corrective action required. (No A/O instrumentation available)
T3F2 PTF #2	21 Sept.		A-2	200' Std. Class "L"	Objective of this flight was to check system electrical and mechanical performance at higher altitude levels. Satisfactory performance of configuration A-2 and charter was evidenced. Laboratory processing difficulties were experienced. Requirement for continuous processing equipment to be investigated.
T3F3	(No Photo Activity - A/C Flight Test Only)				
T4F4 PTF #3	26 Sept.		A-2	90' Std. class "L"	Objective was to further check system performance with regard to mechanical, electrical and optical suitability. A/C communication difficulties restricted completion of test. Flight conditions (Alt. & Tgs.) not within capabilities of configuration IMC. No corrective action required.
T5F5 TF #4	29 Sept.		A-2	(Charter Installed Only) Satisfactory results obtained.	

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October 29, 1955

Flight Test Program, Test Site (Cont'd)

<u>Mission Number</u>	<u>Date</u>	<u>Time</u>	<u>Config.</u>	<u>Film Load</u>	<u>Nature and Results of Mission</u>
6F6 TF #5	30 Sept.		A-2	150' Thin Base	Objective was to check optical performance of system. The first flights over resolution targets were made. Results indicated satisfactory mechanical operation, however improper vacuum was evidenced, resulting in loss of photographic resolution. Processing of thin base film presented problems in handling. Corrective action for vacuum situation being taken by A/C people.
7F7 TF #6	5 Oct.		A-2	50' Std. class "L"	Seven passes were made at various maximum levels over resolution target to determine system resolution. No malfunctions encountered. Evaluation of film indicated vacuum deficiency. Target coverage not as good as on previous mission. Evidence of IMC error on several runs. Correlation with automatic observer of photographic results was made. A/C people to correct vacuum supply by running 4 separate lines to each camera from wheel well. IMC error due to difference between barometric altitude and height above terrain.
8F8	12 Oct.		A-2	50' Std. class "L"	Objective was to make resolution runs over target and to check special 10% light transmission filter. Mission had to abort prior to photo runs. No results obtained. Hydraulic fuel was observed on right oblique camera window after mission. A/C people will relocate hydraulic fitting.
9F9 TF #7	14 Oct.		A-2	50' Std. class "L"	Objective of flight was to make comparison tests with special filter. A/C difficulties at altitude required discontinuance of test. No results obtained and no corrective action required.
10F10	20 Oct.		A-2	50' Std. class "L"	Objective of flight was to accomplish special filter tests. Mission had to abort right after T/O due to A/C difficulties.

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October 29, 1955'

Flight Test Program, Test Site (Cont'd)

Mission
Number

F11F11
PTF #8

<u>Date</u>	<u>Time</u>	<u>Config.</u>	<u>Film Load</u>	<u>Nature and Results of Mission</u>
27 Oct.		A-2	50' Std class "L"	A low altitude mission was accomplished with A/C #3 utilizing type A-1 hatch. Mission was flown using special filter. No difficulties encountered. Four vacuum lines, one to each camera, were utilized vented to the wheel well. Only slight improvement noted. Shutter on Vertical camera lost initial tension.
22 Oct.		A-1 (Tri-Met. only)	50' Std. class "L"	Trial installation, preflight and satisfactory results obtained from operation of the cartographic cameras (HC-730) on initial test flight.

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PTF #9

Note: Three axis rate detector installed in A/C #1 and data is usually obtained on each flight. Satisfactory operation is being experienced with the equipment.

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FLIGHT TEST PROGRAM

December 9, 1955

SUMMARY REPORT

Photo Test Flight	Date	Config.	Film Load	Nature and Results of Mission
No. 10	31 Oct.	A-2	50' std. class "L" (3 cameras)	A test flight was accomplished in A/C 342. Additional test film was required utilizing the 10% light transmission filter. Loss of initial shutter tension was evidenced on post flight with camera #1. Undeveloped film from test was forwarded east for processing and evaluation.
No. 11	1 Nov.	A-2	Thin base (3 cameras) Emulsion No. FE 42192-2	Installation was made in A/C 342. Special filter was on camera #1. Mission accomplished at maximum levels. Post flight indicated malfunction of film tear in magazine #1, resulting in loss of exposed film due to small film pieces covering lens. The thin base film caught on film run out lever. Modification by removal of this lever corrected this situation. Film run-out indication now accomplished electrically. Film from cameras 2 and 3 evaluated indicating satisfactory equipment performance.
No. 12	1 Nov.	A-1	50' std. class "L" (3 cameras) HM-730 camera only	Installation was made in A/C 343. Satisfactory operation of cameras was evidenced with the exception of data recording. Difficulties were hot spots in image and excessive light pulse duration resulting in blur and over-exposure. Action was taken to modify and improve recording features. Loss of resolution was observed on one half of the right oblique photo coverage. Investigation into this indicated that there was hydraulic fluid over R.O. camera window. Corrective action was taken by A/C people.
No. 13	3 Nov.	A-1	Std base class "L"	Installation was made in A/C 343. Initial Flight Test of rocking mount. Results indicated improper operation on first portion of run, then satisfactory operation on all succeeding cycles. Electrical difficulties with the detent mechanism was responsible for this. Re-design action required for correction. Tri-Camera results indicated satisfactory operation with the exception of data recording feature which was still in process of modification.

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Photo Test Flight	Date	Config.	Film Load	Nature and Results of Mission
No. 14	3 Nov.	A-2	Thin base (Emulsion No. FE42192-2)	Installation was made in A/C 342. Special 10% light transmission filter utilized on R. O. camera. Exposed but undeveloped results forwarded to the east for processing and evaluation. Equipment operated satisfactorily.
No. 15 thru 19 (No Flights)				
No. 20	8 Nov.	A-2	Thin base FE42192-2	Installation was made in A/C 342. Special 10% light transmission filter utilized. Half of resultant film was processed and evaluated. The other half was forwarded to the east for special processing and evaluation. Satisfactory operation of equipment was evidenced. Ground check showed loss of shutter initial tension. Difficulty was hand release of shutter trip during ground check. Shutter modification in work.
No. 21	9 Nov.	A-2	180' std. class "L" Emulsion No. 55-474-24	Installation was made in A/C 342. The tilted platen magazine was used on Camera #2 (Vertical) to determine focus changes at altitude with the HR-731. Only 26 exposures made prior to engine difficulties necessitating mission abort. Film remained in magazines for next PTF #22.
No. 22 (No Flight due to A/C Difficulties)				
No. 23	11 Nov.	A-2	same film load as for PTF #21	Installation was made in A/C #342. Test flight made using tilted platen magazine to determine effects of air density and temperature on focus at altitude. Results of this flight indicated that the best point of focus was in the center of the format. Satisfactory operation was evidenced with equipment.
No. 24 (No Flight due to weather)				
No. 25	15 Nov.	A-2	180' std. class "L" Emulsion No. 55-474-2	Installation was made in A/C #342. Tilted Platen Magazine used for through focus runs. Malfunction of film-leader jam prevented film from advancing. Therefore no results on Vertical camera. Proper operation of oblique cameras was evidenced.

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Photo
Test

<u>Flight</u>	<u>Date</u>	<u>Config.</u>	<u>Film Load</u>	<u>Nature and Results of Mission</u>
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No. 26 (No Flight due to A/C engine difficulties)

No. 27 (No Flight due to weather)

(Base Officially Closed from November 21 through December 4)

No. 28	7 Dec.	A-2	180' std. class "L" Emulsion 55-472-2	Installation was made in A/C 344. Tilted platen magazine was utilized to obtain focus at altitude information. Satisfactory operation of equipment was evidenced.
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